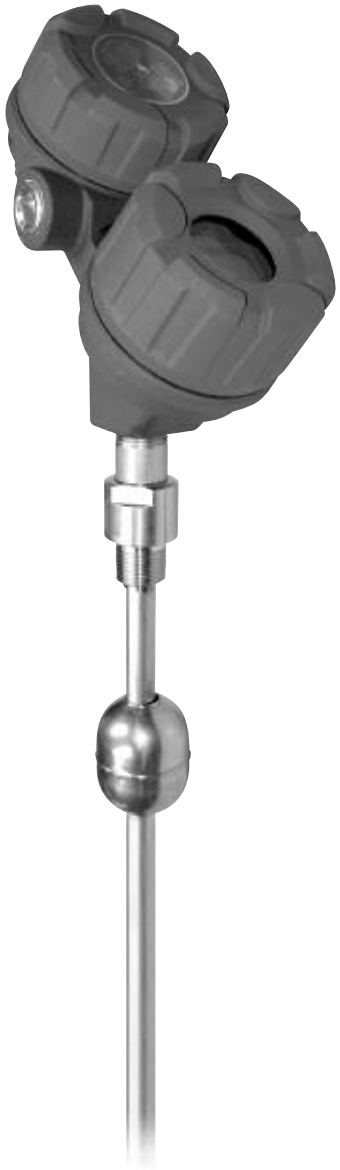
Jupiter®

Enhanced Model 2xx

Software v3.x

Installation and Operating Manual



Magnetostrictive

Level Transmitter

FOUNDATION

HART COMMUNICATION PROTOCOL

PACTware

AMS aware

FDT Group Certified

SIL 2

Magnetrol®

ORION® INSTRUMENTS

A Magnetrol Company

Read this Manual Before Installing

This manual provides information on the Jupiter® magnetostrictive transmitter. It is important that all instructions are read carefully and followed in sequence. Detailed instructions are included in the Installation section of this manual.

Conventions Used in this Manual

Certain conventions are used in this manual to convey specific types of information. General technical material, support data, and safety information are presented in narrative form. The following styles are used for notes, cautions, and warnings.

NOTES

Notes contain information that augments or clarifies an operating step. Notes do not normally contain actions. They follow the procedural steps to which they refer.

Cautions

Cautions alert the technician to special conditions that could injure personnel, damage equipment, or reduce a component's mechanical integrity. Cautions are also used to alert the technician to unsafe practices or the need for special protective equipment or specific materials. In this manual, a caution box indicates a potentially hazardous situation which, if not avoided, may result in minor or moderate injury.

WARNINGS

Warnings identify potentially dangerous situations or serious hazards. In this manual, a warning indicates an imminently hazardous situation which, if not avoided, could result in serious injury or death.

Safety Messages

Follow all standard industry procedures for servicing electrical equipment when working with or around high voltage. Always shut off the power supply before touching any components.

WARNING! Explosion hazard. Do not connect or disconnect equipment unless power has been switched off or the area is known to be non-hazardous.

Low Voltage Directive

For use in Installation Category II, Pollution Degree 2. If equipment is used in a manner not specified by the manufacturer, protection provided by the equipment may be impaired.

Notice of Trademark, Copyright, and Limitations

Orion & Orion logotype, Magnetrol & Magnetrol logotype, and Jupiter are registered trademarks of Magnetrol International.

Performance specifications are effective with date of issue and are subject to change without notice. Magnetrol reserves the right to make changes to the product described in this manual at any time without notice. Magnetrol makes no warranty with respect to the accuracy of the information in this manual.

Warranty

All Magnetrol/Orion electronic level and flow controls are warranted free of defects in materials or workmanship for one full year from the date of original factory shipment.

If returned within the warranty period; and, upon factory inspection of the control, the cause of the claim is determined to be covered under the warranty; then, Magnetrol/Orion will repair or replace the control at no cost to the purchaser (or owner) other than transportation.

Specific to the Jupiter line of products; warranty will be void should the electronics housing or threaded fittings be rotated. Rotating the electronics enclosure could cause damage to the sensor cables.

Magnetrol/Orion shall not be liable for misapplication, labor claims, direct or consequential damage or expense arising from the installation or use of equipment. There are no other warranties expressed or implied, except special written warranties covering some Magnetrol/Orion products.

Quality Assurance

The quality assurance system in place at Magnetrol guarantees the highest level of quality throughout the company. Magnetrol is committed to providing full customer satisfaction both in quality products and quality service.

Magnetrol's quality assurance system is registered to ISO 9001 affirming its commitment to known international quality standards providing the strongest assurance of product/service quality available.

Enhanced Jupiter® Magnetostrictive Transmitter

Table of Contents

1.0 Installation

Caution: If equipment is used in a manner not specified by manufacturer, protection provided by equipment may be impaired

This section provides detailed procedures for properly installing, wiring, configuring and, if needed, troubleshooting the Jupiter magnetostrictive level transmitter.

In most cases externally mounted units will be shipped from the factory attached to the Orion Instruments magnetic level indicator.

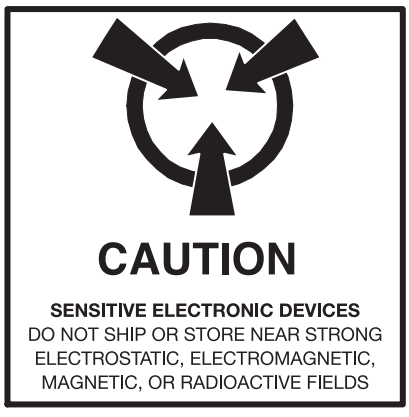
1.1 Unpacking

Caution: Do not rotate the Jupiter electronics enclosure or any threaded fittings. Rotating the electronics enclosure **will void warranty** and could cause damage to sensor cables.

Unpack the instrument carefully. Inspect all units for damage. Report any concealed damage to carrier within 24 hours. Check the contents against the packing slip and purchase order. Check and record the serial number for future reference when ordering parts.

Caution: Do not discard the shipping container until all parts are accounted for and inspected.

1.2 Electrostatic Discharge (ESD) Handling Procedure



Magnetrol/Orion's electronic instruments are manufactured to the highest quality standards. These instruments use electronic components that may be damaged by static electricity present in most work environments.

The following steps are recommended to reduce the risk of component failure due to electrostatic discharge.

- Ship and store circuit boards in anti-static bags. If an anti-static bag is not available, wrap the board in aluminum foil. Do not place boards on foam packing materials.
- Use a grounding wrist strap when installing and removing circuit boards. A grounded workstation is recommended.
- Handle circuit boards only by the edges. Do not touch components or connector pins.
- Make sure that all electrical connections are completely made and none are partial or floating. Ground all equipment to a good, earth ground.

1.3 Before You Begin

Caution: This instrument is intended for use in Installation Category II, Pollution Degree 2 locations.

1.3.1 Site Preparation

Each Jupiter magnetostrictive transmitter is built to match the specifications required within the defined model option number. Wiring terminations will need to be made and the configuration will need to be accomplished.

Ensure that the power to be supplied to the instrument is the same voltage (24 VDC) as ordered with the instrument, and that the wiring between the power supply and the Jupiter transmitter is correct for the type of installation. See *Specifications, Section 2.7*.

NOTE: Applying incorrect voltage will damage the unit.

When installing the Jupiter transmitter in a general purpose or hazardous area, all local, state, and federal regulations and guidelines must be observed. See *Wiring, Section 1.5*.

1.3.2 Equipment and Tools

For installation of a new Jupiter with magnetic level indicator set, refer to Orion Instruments instruction manual 46-638.

To attach a Jupiter transmitter to an existing MLI or direct insertion model, you may need the following tools:

- 5/16" Nut-Driver (for tightening the mounting clamps).
- Screwdriver and assorted hand tools for making conduit and electrical connections.
- Tape measure or ruler if configuring via Set 4 mA and Set 20 mA display screens.
- Digital multimeter or DVM to troubleshoot supply voltage problems.

1.3.3 Operational Considerations

Exterior ambient temperature of the service should not exceed the design specifications of the electronics (-40° to +175° F (-40° to +80° C)). The operating temperature limits of the LCD are -5° to +160° F (-20° to +70° C). Temperatures below -5° F will cause the display to temporarily white out, and temperatures above +160° F will cause the display to go temporarily black. It will recover without damage when the operating temperature range returns. A sunshade should be used if electronics are mounted in direct sunlight.

Maximum process temperature for direct insertion transmitters is +500° F (+260° C). Externally mounted transmitters can be used with process temperatures up to +850° F (+455° C) if the MLI is equipped with an insulation blanket from the factory.

1.3.4 Configuration Information

Some key information is needed to configure the Jupiter transmitter. Complete the following operating parameters table before beginning configuration.

Display	Question	Answer
Units	What units of measurement will be used? (inches or centimeters)	_____
Probe Length	What probe length is listed on the model information?	_____
Set 4.0 mA	What is the 0% reference point for the 4.0 mA value?	_____
Set 20.0 mA	What is the 100% reference point for the 20.0 mA value?	_____

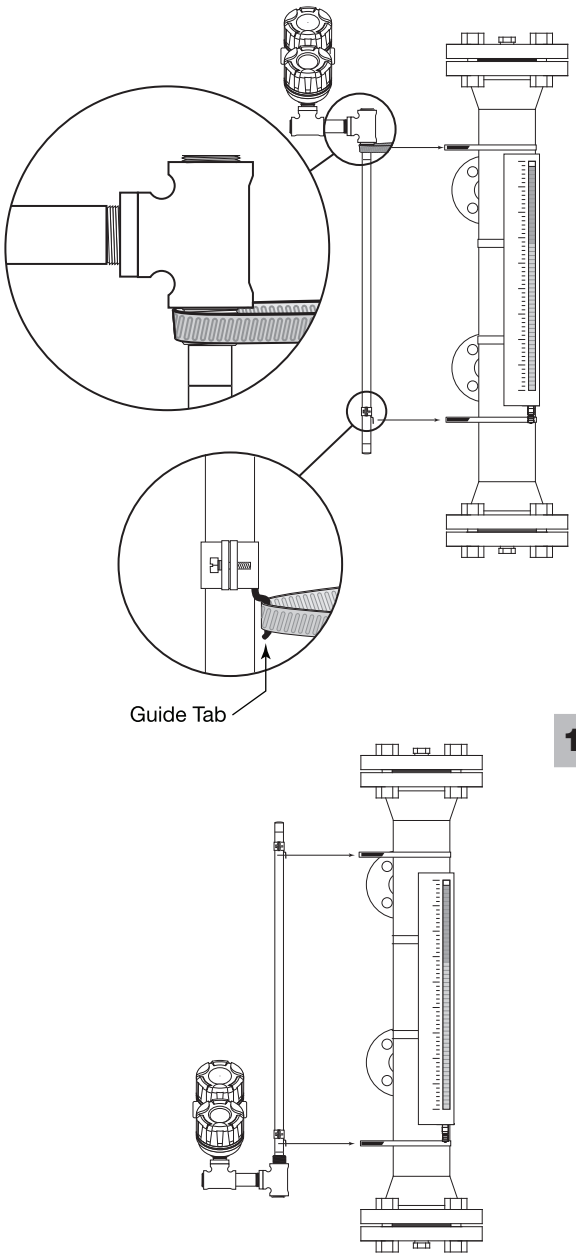


Figure 1
Mounting External Jupiter

1.4 Mounting

1.4.1 External

Caution: Do not rotate the Jupiter electronics enclosure or any threaded fittings. Rotating the electronics enclosure **will void warranty** and could cause damage to sensor cables.

If ordered from the factory with the MLI, the transmitter will be attached to the gauge and configured for the measuring range specified at the time of order placement. If not, use the following directions:

1. Place the Jupiter transmitter and mounting clamps in a convenient location.
2. Position the Jupiter transmitter on the side of the MLI where it will be attached. Mark the location and the exact area where the clamps will be attached to hold the Jupiter in place.

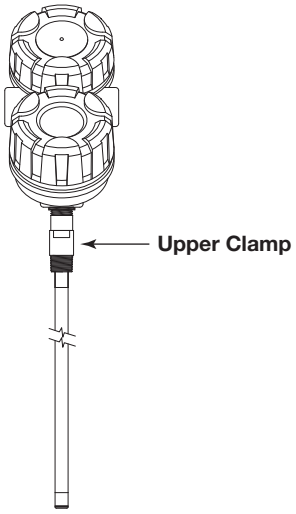


Figure 2

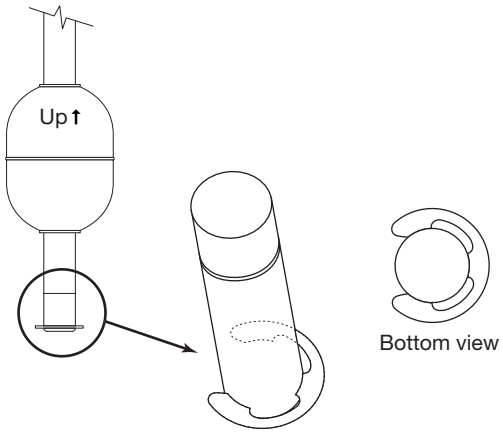


Figure 3
Float Attachment Detail

3. Attach the lower clamp and tighten so that it remains in place, but loose enough so that there is still room to place the guide tab from the Jupiter between the inside of the clamp and the outer diameter of the MLI chamber. See Figure 1.
4. The upper clamp will need to be open to a large enough diameter to be able to mount to the MLI as well as the probe. The upper clamp should be positioned just above the ¾" NPT threads. See Figure 2.
5. Mount the Jupiter guide pin in the lower clamp and tighten. If necessary, use strapping tape to temporarily hold in place on the MLI. See Figure 1.
6. Position the upper clamp to attach the unit to the MLI and tighten. See Figure 1.
7. Discard any tape temporarily holding the Jupiter to the MLI.

1.4.2 Internal, Direct Insertion

Use caution when handling probes to ensure probe is not bent during installation. A bend in the probe may prevent float from traveling freely up and down the probe.

Caution: Do not rotate the Jupiter electronics enclosure or any threaded fittings. Rotating the electronics enclosure **will void warranty** and could cause damage to sensor cables.

NOTE: Direct Insertion models may be calibrated prior to installation by positioning the float at the desired 4 mA & 20 mA points. See Section 1.6 for calibration details.

1. Verify float will pass through vessel opening, if not, it will be necessary to attach the float after the probe is installed.
2. Carefully insert probe into vessel and thread or bolt to the mating connection as appropriate.
3. The float is held on the probe by a C-clip inserted into a groove machined into the tip of the probe. The float is attached or removed by removing and reinserting the C-clip. See figure 3. To ensure proper float orientation, the float is marked "Up ↑".

1.5 Wiring

Caution: The HART version Jupiter transmitter operates at 12–28 VDC. The Fieldbus version operates at the 9–32 VDC. Higher voltages will damage the transmitter.

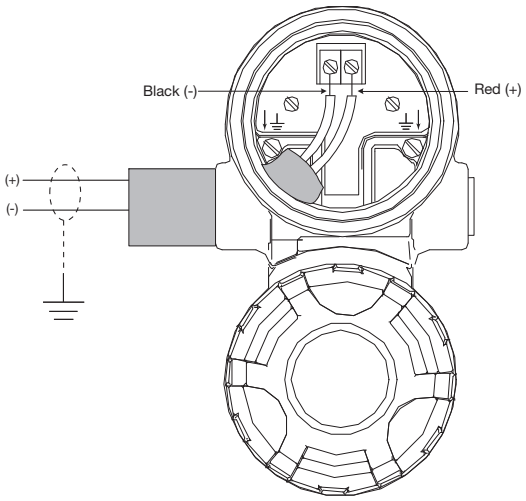


Figure 4
Wiring Diagram

Wiring between the power supply and the Jupiter transmitter should be made using 18–22 AWG shielded twisted pair instrument cable. The transmitter enclosure consists of two compartments. The upper compartment is used to terminate the field wires (wiring termination compartment), and the lower is the electronics compartment.

The Jupiter is offered for use in Class I, Div 1 areas (flammable gasses may be present). Follow the instructions below to complete wiring of the instrument.

WARNING! Explosion hazard. Do not disconnect equipment unless power has been switched off or the area is known to be non-hazardous.

An explosion proof (XP) installation potentially has flammable vapors or media present. Covers on instruments in these areas must remain on and tight while power is applied to the instrument.

Equipment installed in an area classified as Class I, Div 2, reflects that flammable or explosive vapors may be present.

To install intrinsically safe wiring, make sure the IS barrier is properly installed in the safe area or suitably installed in a hazardous area (refer to local plant or facility procedures). Complete the wiring from the barrier to the Jupiter transmitter. See Agency Specifications– Intrinsically Safe Installations, Section 2.4.1.

1. Make sure power is off in any junction box which will be exposed to the atmosphere, unless the area has already been sniffed and approved free of flammable vapors.
2. The top cover (field wiring compartment) of the Jupiter transmitter may be removed. Place the cover in a location where dirt will not get on the threads.
3. Connect shield to an earth ground at the power supply.
4. Connect positive supply wire to the (+) terminal and the negative supply wire to the (-) terminal.
5. Tighten and check connections, then replace cover.
6. An explosion proof seal is not required unless specifically noted by the local code.

Note: All local, state and federal regulations and electrical codes must be adhered to during and after installation.

7. Power may be applied to the instrument when the installation is complete and has been checked by the instrument engineer or safety officer.

1.6 Configuring the Transmitter

The Jupiter transmitter comes configured from the factory with regard to probe, float type, and orientation.

Information on configuring the transmitter using a HART communicator is given in *Configuration Using HART, Section 1.7.*

1.6.1 Operating Parameters

Some key information is needed to calibrate the Jupiter transmitter. Complete the configuration information table. *See Configuration Information, Section 1.3.4.*

1.6.2 Transmitter Display and Keypad

The Jupiter transmitter has a liquid-crystal display (LCD) capable of showing two lines of 8 characters each. Transmitter measurements and configuration menu screens are shown on the LCD.

The transmitter default display is the measurement screen. It cycles every 5 seconds to display STATUS, LEVEL, %OUTPUT, and LOOP information. The transmitter defaults to this display after 5 minutes if no keystrokes are sensed.

The keypad has three arrows used to scroll through the displays and to calibrate the transmitter – the Up and Down Arrow (⇧⇩) keys and the Enter (↵) key.

Arrows	Function in Display Mode	Function in Configuration Mode
Up and Down ⇧ ⇩	Moves forward and backward in the configuration program from one display to another.	Increases or decreases the value displayed or moves to another choice. *Note: Hold arrow key for rapid scrolling.*
Enter ↵	Enters the configuration mode (noted by an exclamation point as the last character in the top display line).	Accepts a value and returns to the display mode.

1.6.3 Password Protection (Default = 0)

The Jupiter transmitter is password protected to restrict access to certain portions of the menu structure that affect the operation of the system. When the proper password is entered, an exclamation point (!) appears as the last character of the first line of the display. The password can be changed to any numerical value up to 255. The password is required whenever configuration values are changed.

The default password installed in the transmitter at the factory is 0 (password disabled). The last step in the configuration menu provides the option to enter a new password. If 0 is entered as a password, the transmitter is no longer password protected and any value in the menu can be altered (except diagnostic values) without entering a confirming password.

NOTE: If the password is not known, the menu item New Password displays an encrypted value representing the present password. Call the factory with this encrypted value to determine the actual password.

1.6.4 Menu: Step-By-Step Procedure

The following table provides a complete explanation of the software menus displayed by the Jupiter transmitter. Use this table as a step-by-step guide to configure the transmitter.

The first column presents the menus shown on the transmitter display. The displays are in the order they would appear if the arrow keys were used to scroll through the menu. The numbers are not shown on the display. They are provided as a reference.

The second column provides the actions to take when configuring the transmitter. Additional information or an explanation of an action is given in the third column.

Models with one float:
Level only calibration — proceed to Section 1.6.4.1
Interface only calibration — proceed to Section 1.6.4.2

Models with two floats:
Interface and level calibration — proceed to Section 1.6.4.3

- The loop output will follow the interface layer.
- Upper liquid level is for display only.

Level and interface calibration — proceed to Section 1.6.4.4

- The loop output will follow overall liquid level.
- Interface level is for display only.

NOTE: Float 1 is the float nearest to the transmitter head, Float 2 is the second (i.e., for top-mounted units, Float 1 is the top level float and Float 2 is the interface layer float; for bottom-mounted models, Float 1 is the interface float, Float 2 is the top level float).

1.6.4.1 **Measurement Type: Level Only**

	Display	Action	Comment
1	Status Level % Output Loop	Transmitter Display	Transmitter default display. *Status, Level, % Output,* and *Loop* values cycle every 8 seconds.
2	Level xxx.xx	Transmitter Display	Level measurement in centimeters or inches
3	% Output xx.xx%	Transmitter Display	Level as a percentage of loop current span
4	Loop xx.xx mA	Transmitter Display	Loop current output (mA)
5	MeasType	Select type of measurement	Choose **Lvl Only**
6	Units	Select units of length	Choose **cm** or **in**
7	Probe Ln xxx.xxlu	**Enter** exact length of probe	6–420 inches (15.24–1066.8 cm)
8	Set 4mA xxx.xxlu	**Enter** the PV value for 4 mA point	Enter 4 mA point in level units
9	Set 20mA xxx.xxlu	**Enter** the PV value for 20 mA point	Enter 20 mA point in level units
10	Lvl Ofst xxx.xxlu	**Enter** the level offset value	Changes zero level as referenced from probe tip
11	Damping xx.x s	**Enter** damping filter time	0–1 second in 0.1 increments 1–25 seconds in 1.0 increments
12	Fault 22mA	**Select** loop current under fault condition	3.6 mA, 22 mA or Hold
13	Poll Adr xx	**Enter** HART polling address number	0–15
14	Trim 4 xxxx	Adjust 4 mA point	Attach a meter to the output. If the output does not equal 4 mA, adjust the value of the display until the meter reads 4 mA
15	Trim 20 xxxx	Adjust 20 mA point	Attach a meter to the output. If the output does not equal 20 mA, adjust the value of the display until the meter reads 20 mA
16	Loop Tst	**Enter** a mA value	Set mA output to a value between 3.6 and 22.0 mA
17	DeadBand xx.x	Factory Setting	Diagnostic, factory setting
18	Snsr Mnt	**Enter** mounting type	**MLI Top** (external probe; transmitter top mounted) **MLI Bot** (external probe; transmitter bottom mounted) **Dir Near** (NPT, BSP, and 600# or less flanged probe) **Dir Ext** (flanged probes 900# class and over)
19	Trim Lvl xx.xx	Enter value to adjust Level reading	-20.00 inches ≤ Trim Lvl ≤ 20.00 inches
20	F1 Cnts	Display only	For factory diagnostic use
21	New Pass Xxx	**Enter** new password	Use up and down keys to select desired value (0–255)
22	Language (select)	Select from English or Spanish	Changes display language
23	Jupiter HT Ver 3.0A	Display only	Product firmware version

1.6.4.1 **Measurement Type: Level Only (cont.)**

	Display	Action	Comment
24	DispFact (select)	**Select** Yes to display factory parameter menus	
25	History (current status)	**Enter** to view history of exceptions	Diagnostic Display
26	Run Time	Display only	Elapsed time since power on; reset to zero with History Reset
27	History Reset	Press **Enter** and select yes to clear history	
28	Conv Fct xxxxxx	Factory parameter	Do not adjust
29	Scl Ofst	Factory parameter	Do not adjust
30	F1Thresh	Factory parameter	Do not adjust
31	F1 Polar	Factory parameter	Do not adjust
32	Senstvty	Factory parameter	Do not adjust
33	Drv Ampl	Factory parameter	Do not adjust
34	ElecTemp xxx C	Diagnostic Display	Present temperature in electronics compartment (degrees C)
35	Max Temp xxx c	Diagnostic Display	Maximum electronics temperature recorded (degrees C)
36	Min Temp xxx C	Diagnostic Display	Minimum electronics temperature recorded (degrees C)

1.6.4.2 **Measurement Type: Interface Only**

	Display	Action	Comment
1	Status IfcLvl % Output Loop	Transmitter Display	Transmitter default display. *Status, Interface Level, % Output,* and *Loop* values cycle every 8 seconds.
2	IfcLevel xxx.xx	Transmitter Display	Interface level measurement in centimeters or inches
3	% Output xx.xx%	Transmitter Display	Interface level as a percentage of loop current span
4	Loop xx.xx mA	Transmitter Display	Loop current output (mA)
5	MeasType	Select type of measurement	Choose **Ifc Only**
6	Units	Select units of length	Choose **cm** or **in**
7	Probe Ln xxx.x	**Enter** exact length of probe	6–420 inches (15.24–1066.8 cm)
8	Set 4mA xxx.xxlu	**Enter** the PV value for 4 mA point	Enter 4 mA point in level units
9	Set 20mA xxx.xxlu	**Enter** the PV value for 20 mA point	Enter 20 mA point in level units
10	Lvl Ofst xxx.xxlu	**Enter** the level offset value	Changes zero level as referenced from probe tip
11	Damping xx.x s	**Enter** damping filter time	0–1 second in 0.1 increments 1–25 seconds in 1.0 increments
12	Fault 22mA	**Select** loop current under fault condition	3.6 mA, 22 mA or Hold
13	Poll Adr xx	**Enter** HART polling address number	0–15
14	Trim 4 xxxx	Adjust 4 mA point	Attach a meter to the output. If the output does not equal 4 mA, adjust the value of the display until the meter reads 4 mA
15	Trim 20 xxxx	Adjust 20 mA point	Attach a meter to the output. If the output does not equal 20 mA, adjust the value of the display until the meter reads 20 mA
16	Loop Tst	**Enter** a mA value	Set mA output to a value between 3.6 and 22.0 mA
17	DeadBand xx.x	Factory Setting	Diagnostic, factory setting
18	Snsr Mnt	**Enter** mounting type	**MLI Top** (external probe; transmitter top mounted) **MLI Bot** (external probe; transmitter bottom mounted) **Dir Near** (NPT, BSP, and 600# or less flanged probe) **Dir Ext** (flanged probes 900# class and over)
19	Trim Ifc xx.xx	Enter value to adjust Interface reading	-20.00 inches ≤ Lvl Trim ≤ 20.00 inches
20	F1 Cnts	Display only	For factory diagnostic use
21	New Pass Xxx	**Enter** new password	Use up and down keys to select desired value (0–255)
22	Language (select)	Select from English or Spanish	Changes display language
23	Jupiter HT Ver 3.0A	Display only	Product software version

1.6.4.2 **Measurement Type: Interface Only (cont.)**

	Display	Action	Comment
24	DispFact (select)	**Select** Yes to display factory parameter menus	
25	History (current status)	**Enter** to view history of exceptions	Diagnostic Display
26	Run Time	Display only	Elapsed time since power on; reset to zero with history reset
27	History Reset	Press **Enter** and select yes to clear history	
28	Conv Fct xxxxxx	Factory parameter	Do not adjust
29	Scl Ofst	Factory parameter	Do not adjust
30	F1Thresh	Factory parameter	Do not adjust
31	F1 Polar	Factory parameter	Do not adjust
32	Senstvty	Factory parameter	Do not adjust
33	Drv Ampl	Factory parameter	Do not adjust
34	ElecTemp xxx C	Diagnostic Display	Present temperature in electronics compartment (degrees C)
35	Max Temp xxx c	Diagnostic Display	Maximum electronics temperature recorded (degrees C)
36	Min Temp xxx C	Diagnostic Display	Minimum electronics temperature recorded (degrees C)

1.6.4.3 **Measurement Type: Interface & Level**

	Display	Action	Comment
1	Status IfcLvl % Output Loop	Transmitter Display	Transmitter default display. *Status, Interface Level, % Output,* and *Loop* values cycle every 8 seconds.
2	IfcLevel xxx.xx	Transmitter Display	Interface level measurement in centimeters or inches
3	% Output xx.xx%	Transmitter Display	Interface level as a percentage of loop current span
4	Loop xx.xx mA	Transmitter Display	Loop current output (mA)
5	Level	Transmitter Display	Displays top liquid level
6	MeasType	Select type of measurement	Choose **Ifc&Lvl**
7	Units	Select units of length	Choose **cm** or **in**
8	Probe Ln xxx.x	**Enter** exact length of probe	6–420 inches (15.24–1066.8 cm)
9	Set 4mA xxx.xxlu	**Enter** the PV value for 4 mA point	Enter 4 mA point in level units
10	Set 20mA xxx.xxlu	**Enter** the PV value for 20 mA point	Enter 20 mA point in level units
11	Lvl Ofst xxx.xxlu	**Enter** the level offset value	Changes zero level as referenced from probe tip
12	Damping xx.x s	**Enter** damping filter time	0–1 second in 0.1 increments 1–25 seconds in 1.0 increments
13	Fault 22mA	**Select** loop current under fault condition	3.6 mA, 22 mA or Hold
14	Poll Adr xx	**Enter** HART polling address number	0–15
15	Trim 4 xxxx	Adjust 4 mA point	Attach a meter to the output. If the output does not equal 4 mA, adjust the value of the display until the meter reads 20 mA
16	Trim 20 xxxx	Adjust 20 mA point	Attach a meter to the output. If the output does not equal 4 mA, adjust the value of the display until the meter reads 20 mA
17	Loop Tst	**Enter** a mA value	Set mA output to a value between 3.6 and 22.0 mA
18	DeadBand xx.x	Factory Setting	Diagnostic, factory setting
19	Snsr Mnt	**Enter** mounting type	**MLI Top** (external probe; transmitter top mounted) **MLI Bot** (external probe; transmitter bottom mounted) **Dir Near** (NPT, BSP, and 600# or less flanged probe) **Dir Ext** (flanged probes 900# class and over)
20	Trim Lvl xx.xx	Enter value to adjust Level reading	-20.00 inches ≤ Trim Lvl ≤ 20.00 inches
21	Trim Ifc xx.xx	Enter value to adjust Interface reading	-20.00 inches ≤ Trim Ifc ≤ 20.00 inches
22	F1 Cnts	Display only	For factory diagnostic use
23	F2 Cnts	Display only	For factory diagnostic use

1.6.4.3 **Measurement Type: Interface & Level (cont.)**

	Display	Action	Comment
24	New Pass Xxx	**Enter** new password	Use up and down keys to select desired value (0–255)
25	Language (select)	Select from English or Spanish	Changes display language
26	Jupiter HT Ver 3.0A	Display only	Product software version
27	DispFact (select)	**Select** Yes to display factory parameter menus	
28	History (current status)	**Enter** to view history of exceptions	Diagnostic Display
29	Run Time	Display only	Elapsed time since power on; reset to zero with History Reset
30	History Reset	Press **Enter** and select yes to clear history	
31	Conv Fct xxxxxx	Factory parameter	Do not adjust
32	Scl Ofst	Factory parameter	Do not adjust
33	F1Thresh	Factory parameter	Do not adjust
34	F1 Polar	Factory parameter	Do not adjust
35	F2Thresh	Factory parameter	Do not adjust
36	F2 Polar	Factory parameter	Do not adjust
37	Senstvty	Factory parameter	Do not adjust
38	Drv Ampl	Factory parameter	Do not adjust
39	Min Sep	Factory parameter	Do not adjust
40	ElecTemp xxx C	Diagnostic Display	Present temperature in electronics compartment (degrees C)
41	Max Temp xxx c	Diagnostic Display	Maximum electronics temperature recorded (degrees C)
42	Min Temp xxx C	Diagnostic Display	Minimum electronics temperature recorded (degrees C)

1.6.4.4 **Measurement Type: Level & Interface**

	Display	Action	Comment
1	Status Level % Output Loop	Transmitter Display	Transmitter default display. *Status, Level, % Output,* and *Loop* values cycle every 8 seconds.
2	Level xxx.xx	Transmitter Display	Level measurement in centimeters or inches
3	% Output xx.xx%	Transmitter Display	Level as a percentage of loop current span
4	Loop xx.xx mA	Transmitter Display	Loop current output (mA)
5	IfcLevel	Transmitter Display	Displays interface level
6	MeasType	Select type of measurement	Choose **Lvl&Ifc**
7	Units	Select units of length	Choose **cm** or **in**
8	Probe Ln xxx.x	**Enter** exact length of probe	6–420 inches (15.24–1066.8 cm)
9	Set 4mA xxx.xxlu	**Enter** the PV value for 4 mA point	Enter 4 mA point in level units
10	Set 20mA xxx.xxlu	**Enter** the PV value for 20 mA point	Enter 20 mA point in level units
11	Lvl Ofst xxx.xxlu	**Enter** the level offset value	Changes zero level as referenced from probe tip
12	Damping xx.x s	**Enter** damping filter time	0–1 second in 0.1 increments 1–25 seconds in 1.0 increments
13	Fault 22mA	**Select** loop current under fault condition	3.6 mA, 22 mA or Hold
14	Poll Adr xx	**Enter** HART polling address number	0–15
15	Trim 4 xxxx	Adjust 4 mA point	Attach a meter to the output. If the output does not equal 4 mA, adjust the value of the display until the meter reads 4 mA
16	Trim 20 xxxx	Adjust 20 mA point	Attach a meter to the output. If the output does not equal 20 mA, adjust the value of the display until the meter reads 20 mA
17	Loop Tst	**Enter** a mA value	Set mA output to a value between 3.6 and 22.0 mA
18	DeadBand xx.x	Factory Setting	Diagnostic, factory setting
19	Snsr Mnt	**Enter** mounting type	**MLI Top** (external probe; transmitter top mounted) **MLI Bot** (external probe; transmitter bottom mounted) **Dir Near** (NPT, BSP, and 600# or less flanged probe) **Dir Ext** (flanged probes 900# class and over)
20	Trim Lvl xx.xx	Enter value to adjust Level reading	-20.00 inches ≤ Trim Lvl ≤ 20.00 inches
21	Trim Ifc xx.xx	Enter value to adjust Interface reading	-20.00 inches ≤ Trim Ifc ≤ 20.00 inches
22	F1 Cnts	Display only	For factory diagnostic use
23	F2 Cnts	Display only	For factory diagnostic use

1.6.4.4 **Measurement Type: Level & Interface (cont.)**

	Display	Action	Comment
24	New Pass Xxx	**Enter** new password	Use up and down keys to select desired value (0–255)
25	Language (select)	Select from English or Spanish	Changes display language
26	Jupiter HT Ver 3.0A	Display only	Product software version
27	DispFact (select)	**Select** Yes to display factory parameter menus	
28	History (current status)	**Enter** to view history of exceptions	Diagnostic Display
29	Run Time	Display only	Elapsed time since power on; reset to zero with History Reset
30	History Reset	Press **Enter** and select yes to clear history	
31	Conv Fct xxxxxx	Factory parameter	Do not adjust
32	Scl Ofst	Factory parameter	Do not adjust
33	F1Thresh	Factory parameter	Do not adjust
34	F1 Polar	Factory parameter	Do not adjust
35	F2Thresh	Factory parameter	Do not adjust
36	F2 Polar	Factory parameter	Do not adjust
37	Senstvty	Factory parameter	Do not adjust
38	Drv Ampl	Factory parameter	Do not adjust
39	Min Sep	Factory parameter	Do not adjust
40	ElecTemp xxx C	Diagnostic Display	Present temperature in electronics compartment (degrees C)
41	Max Temp xxx c	Diagnostic Display	Maximum electronics temperature recorded (degrees C)
42	Min Temp xxx C	Diagnostic Display	Minimum electronics temperature recorded (degrees C)

1.7 Configuration Using HART

A HART (Highway Addressable Remote Transducer) remote unit, such as a HART 375 handheld communicator, can be used to provide a communication link to the Jupiter transmitter. When connected to the control loop, the same system measurement readings shown on the transmitter are shown on the communicator. In addition, the communicator can be used to configure the transmitter.

The HART communicator may need to be updated to include the Jupiter software (Device Descriptors). Contact your local HART Service Center for additional information. Device manufacturer listed as Magnetrol International.

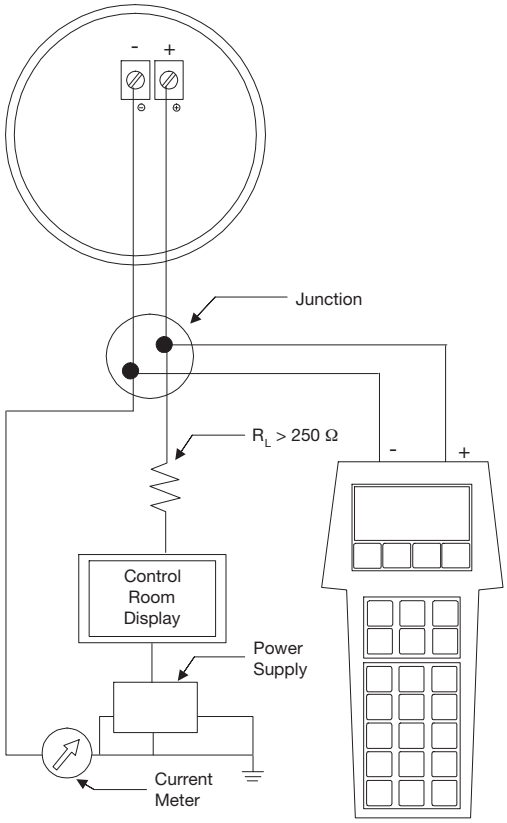


Figure 5

1.7.1 Connections

A HART communicator can be operated from a remote location by connecting to a remote junction or by connecting directly to the terminal block in the electronics housing of the Jupiter transmitter.

HART uses the Bell 202 frequency shift key technique of high-frequency digital signals. It operates on the 4–20 mA loop and requires a minimum of 250 Ω load resistance. A typical connection between a communicator and the Jupiter transmitter is illustrated.

1.7.2 HART Display Menu

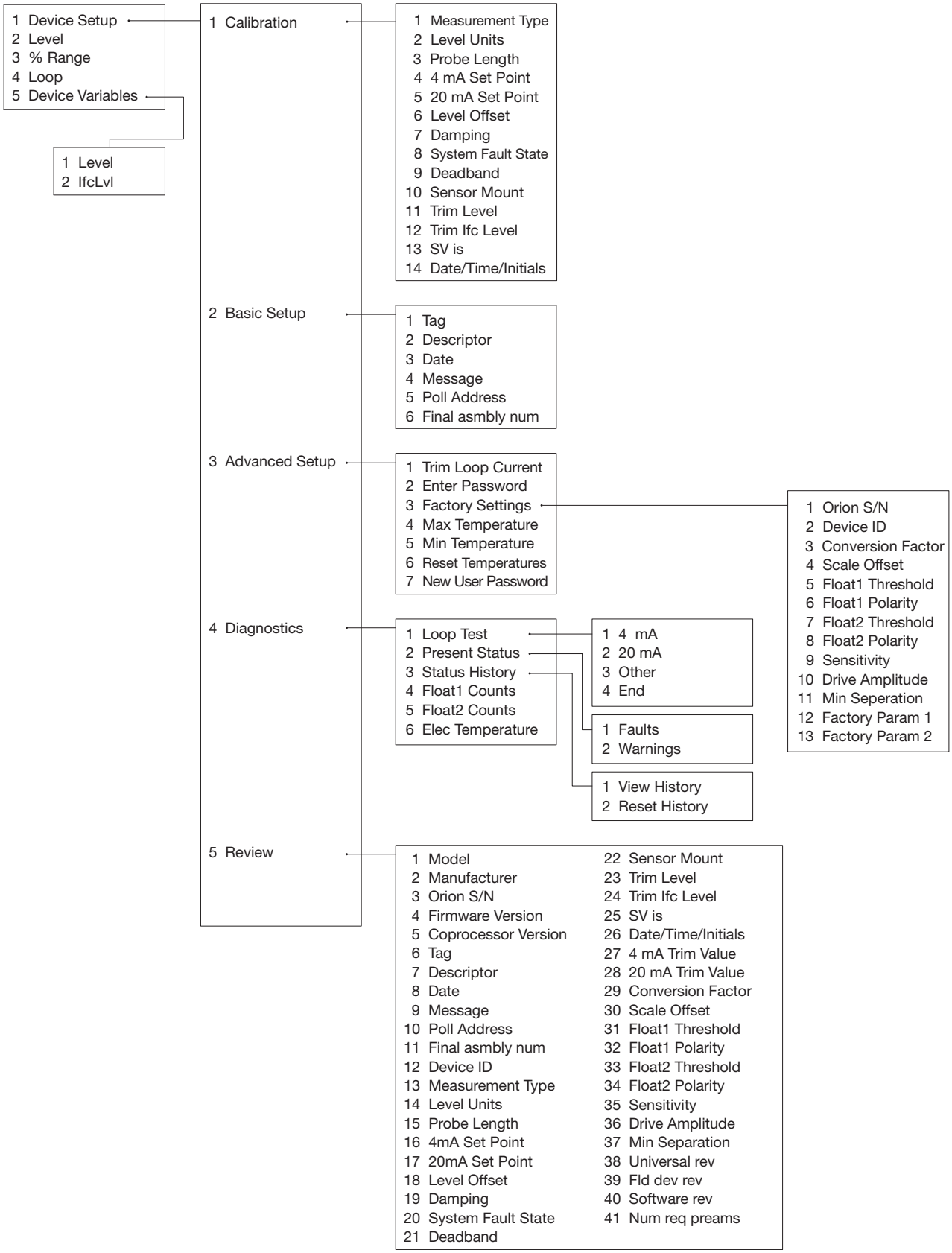
A typical HART communicator display is an 8-line by 21-character LCD. Usually the bottom line of each menu is reserved for software-defined function keys (F1–F4). For detailed operating information, refer to the instruction manual provided with the HART communicator.

The Jupiter transmitter online menu tree is shown in the following illustration. Open the menu by pressing the alphanumeric key 1, Device Setup, to display the second-level menu.

1.7.3 HART Revision Table

HART Version Software	HCF Release Date	Compatible with Jupiter
Dev V2, DD V1	July 2003	Version 2.0A through 2.0B
Dev V3, DD V2	July 2006	Version 3.0A and later

1.7.4 HART Menu (Jupiter 2.0)



1.8 FOUNDATION Fieldbus Digital Communications

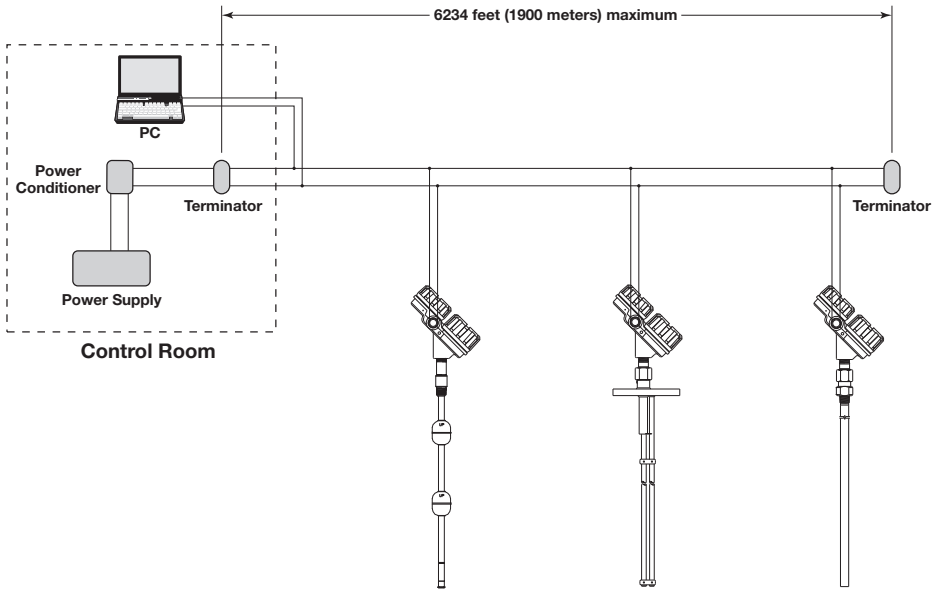
1.8.1 Description

FOUNDATION Fieldbus™ is a digital communications system that serially interconnects devices in the field. A Fieldbus system is similar to a Distributed Control System (DCS) with two exceptions:

- Although a Fieldbus system can use the same physical wiring as an existing 4–20 mA device, Fieldbus devices are not connected point-to-point, but rather are multidropped on a single pair of wires (referred to as a segment).
- Fieldbus is a system that allows the user to distribute control across a network. Fieldbus devices are smart and actually maintain control over the system.

Unlike 4–20 mA analog installations in which the two wires carry a single variable (the varying 4–20 mA current), a digital communications scheme such as Fieldbus considers the two wires as a network. The network can carry many process variables as well as other information. The Jupiter transmitter is a FOUNDATION Fieldbus™ registered device that communicates with the H1 Foundation Fieldbus protocol operating at 31.25 kbits/sec. The H1 physical layer is an approved IEC 61158 standard. The illustration below shows a typical Fieldbus installation.

An IEC61158 shielded twisted pair wire segment can be as long as 6234 feet (1900 meters) without a repeater. Up to 4 repeaters per segment can be used to extend the distance. The maximum number of devices allowed on a Fieldbus segment is 32 although this depends on the current draw of the devices on any given segment.



Typical Fieldbus Installation

Details regarding cable specifications, grounding, termination, and other network information can be found in IEC 61158 or at www.fieldbus.org.

1.8.2 Benefits

The benefits of Fieldbus can be found throughout all phases of an installation:

1. **Design/Installation:** Connecting multiple devices to a single pair of wires means less wire and fewer I/O equipment. Initial Engineering costs are also reduced because the Fieldbus Foundation requires interoperability, defined as "the ability to operate multiple devices in the same system, regardless of manufacturer, without a loss of functionality."

   All Foundation Fieldbus devices must be tested for interoperability by the Fieldbus Foundation. Orion Jupiter device registration information can be found listed under Magnetrol International at **www.fieldbus.org**.

2. **Operation:** With control now taking place within the devices in the field, better loop performance and control are the result. A Fieldbus system allows for multiple variables to be brought back from each device to the control room for additional trending and reporting.

3. **Maintenance:** The self-diagnostics residing in the smart field devices minimizes the need to send maintenance personnel to the field.

1.8.3 Device Descriptions

The function of a Fieldbus device is determined by the arrangement of a system of blocks defined by the Fieldbus Foundation. The types of blocks used in a typical User Application are described as follows:

Resource Block describes the characteristics of the Fieldbus device such as the device name, manufacturer, and serial number.

Transducer Blocks contain information such as calibration data and sensor type. They are used to connect the sensor to the input function blocks.

Function Blocks are built into the Fieldbus devices as needed to provide the desired control system behavior. The input and output parameters of function blocks can be linked over the Fieldbus. There can be numerous function blocks in a single User Application.

An important requirement of Fieldbus devices is the interoperability concept mentioned above. Device Description (DD) technology is used to achieve this interoperability. The DD provides extended descriptions for each object and provides pertinent information needed by the host system.

DDs are similar to the drivers that your personal computer (PC) uses to operate peripheral devices connected to it. Any Fieldbus host system can operate with a device if it has the proper DDs for that device.

The most recent DD and Common File Format (CFF) files can be found on Magnetrol's web site at **magnetrol.com** or fieldbus.org.

1.8.4 Intrinsically Safe

H1 supports Intrinsic Safety (IS) applications with bus powered devices. To accomplish this, an IS barrier is placed between the power supply in the safe area and the device in the hazardous area.

H1 also supports the Fieldbus Intrinsically Safe Concept (FISCO) model which allows more field devices in a network. The FISCO model considers the capacitance and inductance of the wiring to be distributed along its entire length. The stored energy during a fault will be less and more devices are permitted on a pair of wires. Instead of the conservative entity model, which only allows about 90 mA of current, the FISCO model allows a maximum of 112 mA for Class II C installations and 319 mA for Class II B installations.

FISCO certifying agencies have limited the maximum trunk length to 1000 meters and spur length to 30 meters because the FISCO model does not rely on standardized ignition curves.

The Orion Jupiter is available with an entity IS, FISCO IS, and explosion proof approvals.

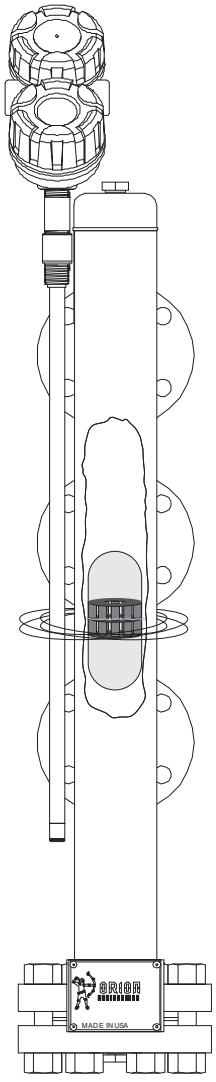
2.0 Reference Information

This section presents an overview of the operation of the Jupiter magnetostrictive transmitter, information on troubleshooting common problems, listing of agency approvals, lists of replacement and recommended spare parts, and detailed functional, performance and physical specifications for the instrument.

2.1 Description

The Jupiter is a two-wire, 24 VDC level transmitter based on the concept of magnetostrictive level measurement technology.

The Jupiter electronics are housed in an ergonomic housing of two tandem compartments angled at a 45° angle for ease of wiring and calibration. The electronics compartment is permanently attached to the probe assembly via an explosion-proof seal.



2.2 Theory of Operation

Magnetostrictive level sensors are based on "time-of-flight" technology.

Permanent magnets contained within a float device tracks the process liquid as it changes level. The Jupiter probe is fixed within close proximity to this magnetic field. A short current pulse is then applied to a specially designed wire alloy contained within the probe. The interaction of the current pulse and magnetic field cause distortion in a small section of the wire alloy. This in turn creates a vibratory disturbance which begins to travel through the wire at a very constant rate of speed. The disturbance is later detected via a sensing device at the top of the probe and sent to the electronics unit where it is filtered and amplified.

Extremely accurate level measurement can thus be obtained precisely measuring the elapsed time between the current pulse (start), and the returned pulse (stop). The Jupiter electronics module processes these signals, and then performs various mathematical operations in order to provide the user with an analog and/or digital representation of the liquid level.

2.3 Troubleshooting

The Jupiter transmitter is designed and manufactured for years of trouble free operation over a wide range of conditions. Common transmitter problems are discussed in terms of their symptoms and recommended corrective actions.

Caution: Do not rotate the Jupiter electronics enclosure or any threaded fittings. Rotating the electronics enclosure **will void warranty** and could cause damage to sensor cables.

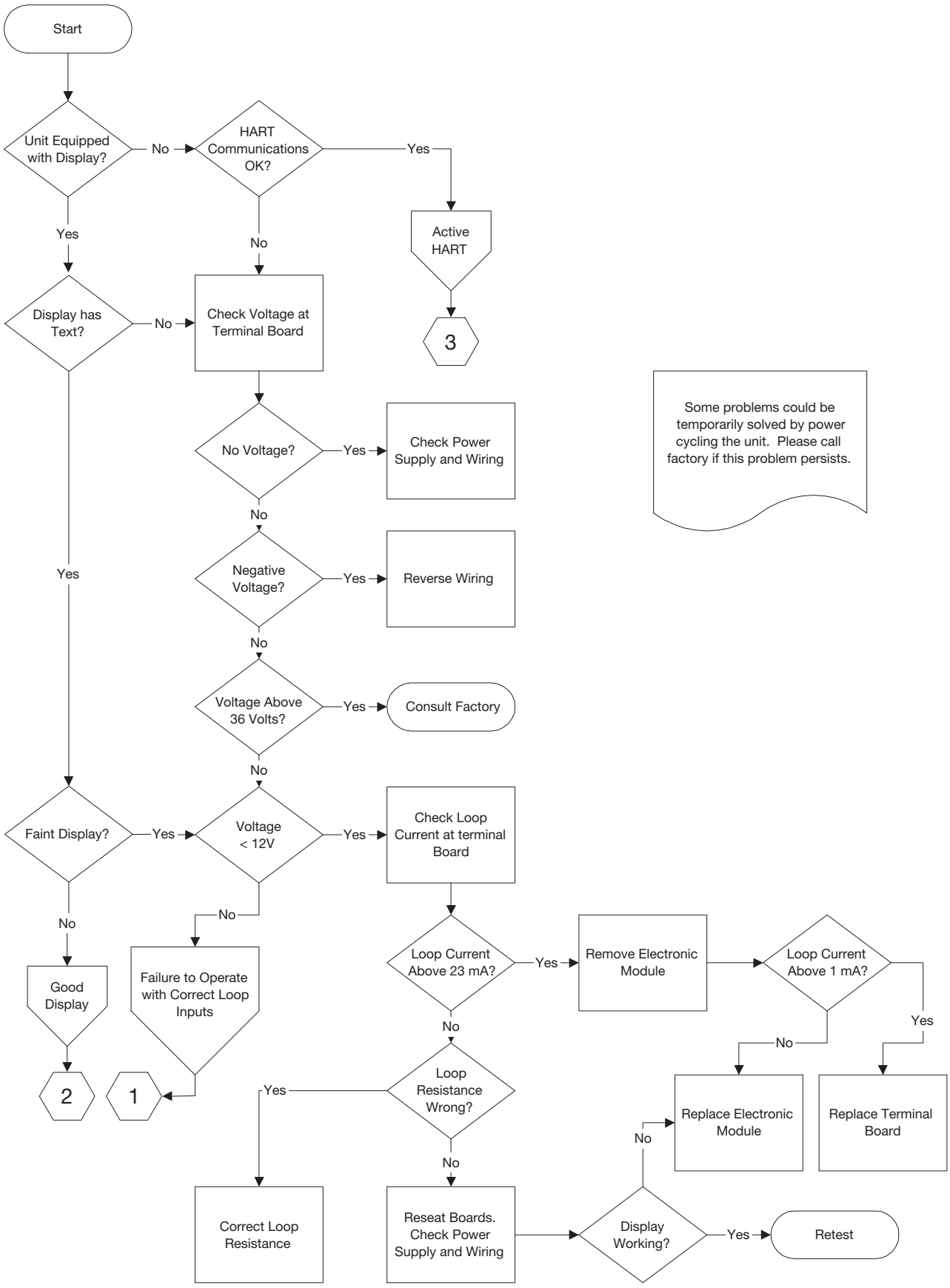
2.3.1 Troubleshooting

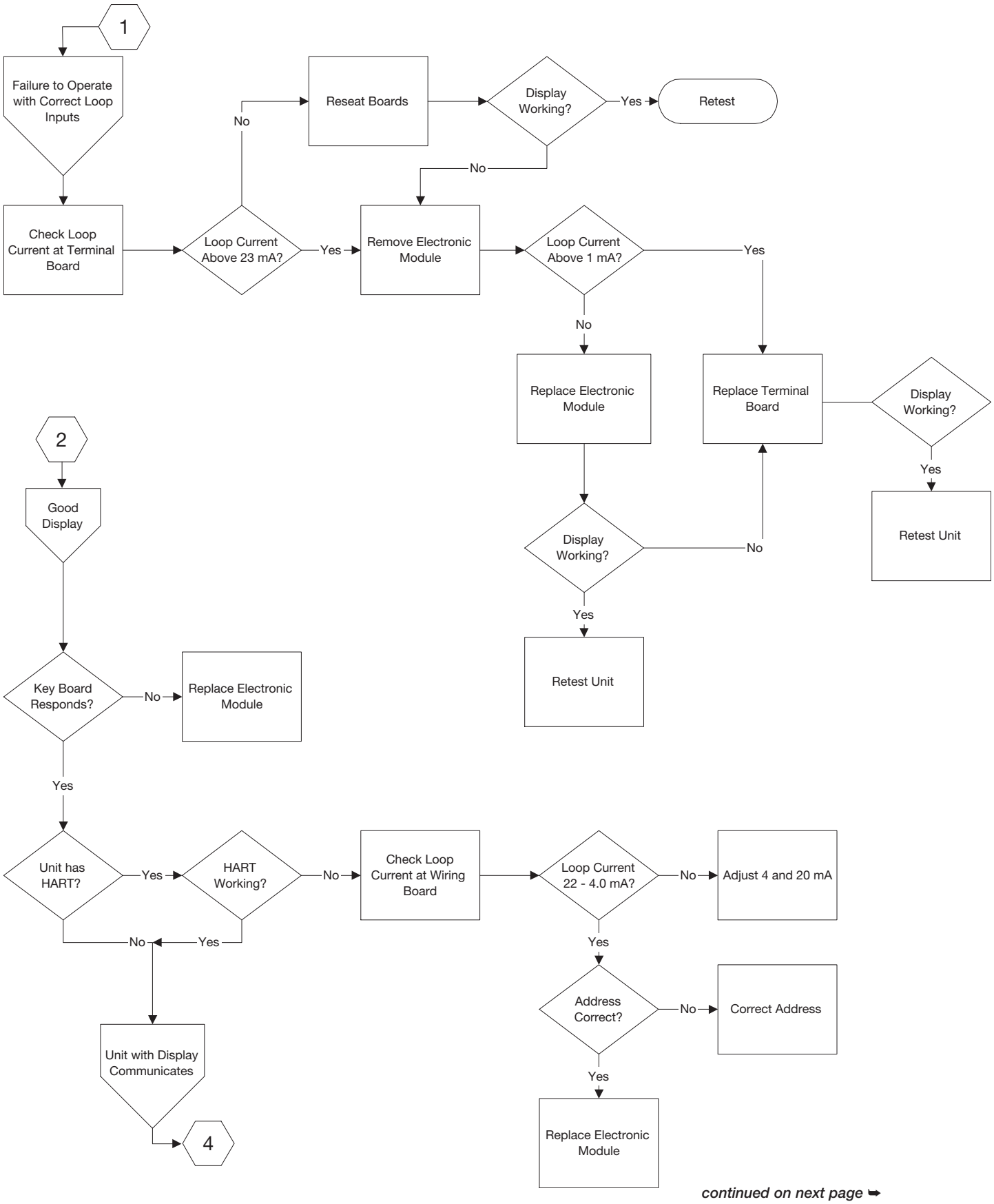
Problem		Solution
Transmitter does not track level	(External Mount)	Remove transmitter from piping column and test with re-alignment magnet. Run magnet from bottom to top of probe. Check zero and span calibration. If no change in output, consult the factory.
	(Direct Insertion)	Float stuck, Probe bent (Chamber)
Float inside the level gauge is moving slow or not at all.		Ensure that the magnetic level indicator is plumb. The process fluid being measured may be too viscous and heat tracing may be required to make the material more fluid. The specific gravity of the process fluid and float weight may need to be reverified. The liquid being measured may contain magnetic particles collecting on the magnetic section of the float causing drag. If this happens magnetic trap assemblies can be purchased from the factory. Visual inspection of the float may be required to see if the float has collapsed.
LEVEL, % OUTPUT, and LOOP values are all inaccurate.		Basic configuration data is questionable. Reconfigure probe length and offset. Ensure the level is accurate. Reconfigure loop values.
LEVEL, % OUTPUT, and LOOP values fluctuate.		Turbulence, increase damping factor until readings stabilize.
Level reading on display is correct, but loop value is stuck at 4 mA.		Set poll address to zero

2.3.2 Status Messages

Display Message	Action	Comment
OK	None	Normal operating mode
Initial	None	Shown at power-up during self check
TrimReqd	Factory set Loop values are defaults, loop output may be in accurate	Consult Factory
Cal Reqd	Factory set default calibration parameters are in use, level reading may be inaccurate	Consult Factory
Lo Temp	Present temperature in electronics compartment is below -40° F (-40° C)	Transmitter may need to be moved to ensure temperature is within specification
Hi Temp	Present temperature in electronics compartment is above +176° F (+80° C)	Transmitter may need to be moved to ensure temperature is within specification
Float 2 Fail	No level signal detected from float 2	Make sure 2 floats are being used, are not damaged, and within measuring range
Float 1 Fail	No level signal detected from float 1	Make sure float is not damaged and within measurement range
No Signal	No signal detected from any float	Make sure float is not damaged and within measurement range
LoopFail	Loop current differs from expected value	Consult Factory
Snsr Brd	Measurement board not responding	Consult Factory
DfltParm	Internal non-volatile parameters have been reset to default values	Consult Factory

2.3.3 Troubleshooting Flowchart





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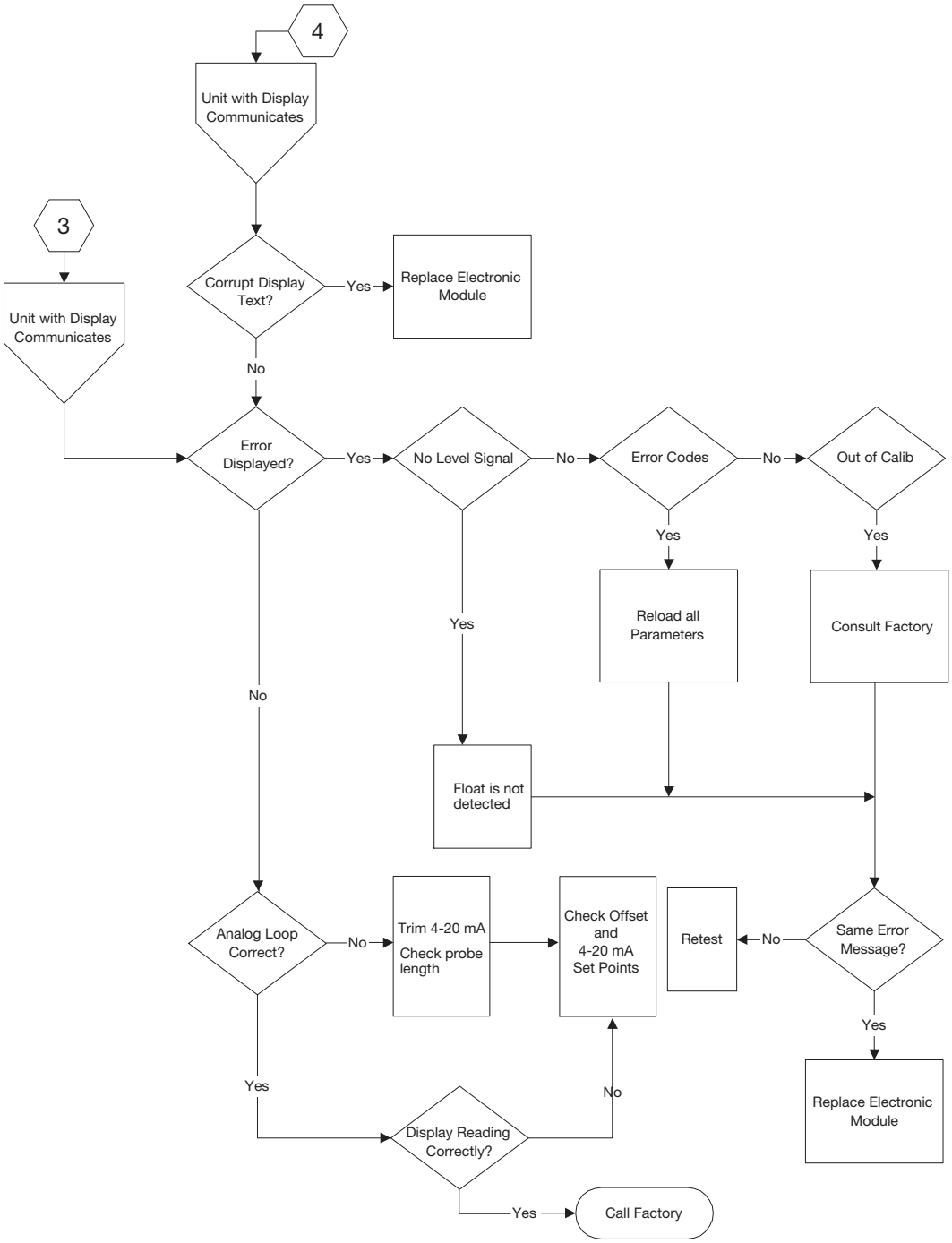

4
Unit with Display Communicates
3
Unit with Display Communicates
Corrupt Display Text?
Yes
Replace Electronic Module
No
Error Displayed?
Yes
No Level Signal
No
Error Codes
No
Out of Calib
Yes
Yes
Yes
Reload all Parameters
Consult Factory
No
Float is not detected
Analog Loop Correct?
No
Trim 4-20 mA
Check probe length
Check Offset and 4-20 mA Set Points
Retest
No
Same Error Message?
Yes
Yes
No
Display Reading Correctly?
Replace Electronic Module
Yes
Call Factory

2.4 Agency Drawing/Specifications

2.4.1 Agency Drawing

HAZARDOUS LOCATIONS

Model 2XX-XXXXXXX-XXX Jupiter Transmitter

Intrinsically Safe for CL I, Div. 1 Groups A,B,C,D
CL II, Div. 1 Groups E,F,G
CL III

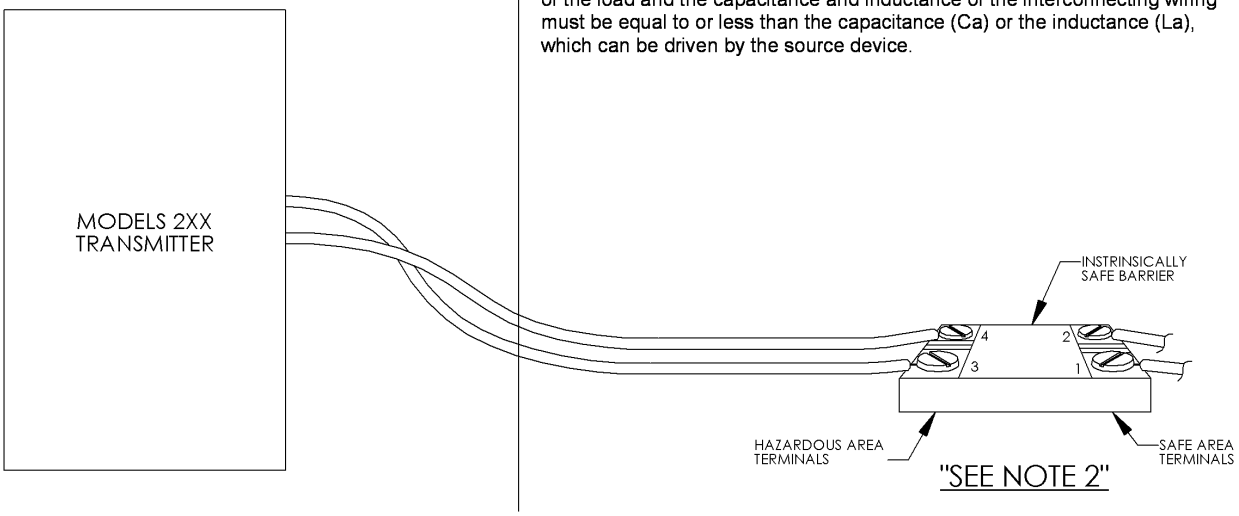
ENTITY
Vmax = 28.6V
Imax = 140mA
Pmax = 1.0W
Ci = 5.5nF
Li = 9.4uH

NON HAZARDOUS LOCATIONS

Limiting Values

Voc <=26.8V Ca >=5.5nF
Isc <=140mA La >=9.4uH

The voltage (Vmax) and current (Imax), which the transmitter can receive, must be equal to or greater than the maximum open circuit voltage (Voc or V+) and the maximum short circuit current (Isc or Ie) which can be delivered by the source device. In addition, the maximum capacitance (Ci) and inductance (Li) of the load and the capacitance and inductance of the interconnecting wiring must be equal to or less than the capacitance (Ca) or the inductance (La), which can be driven by the source device.



NOTES:

1. Manufacturers installation instructions supplied with the protective barrier and the CEC (for CSA) or the NEC and ANSI/ISA RP 12.6 (For FMRC) must be followed when installing the equipment.
2. Control equipment connected to protective barriers must not use or generate more than 250 Vdc or Vrms.
3. NRTL listed dust tight seals must be used when device is installed in Class II & III environments.
4. No revisions to this drawing without FMRC and CSA approval.
5. For CSA: Exia Intrinsically Safe / Securitie Intrinseque
6. For CSA: Warning-Explosion Hazard – Substitution of components may impair suitability for hazardous Locations
7. For supply connections, use wire suitable for operating temperature. For 71°C ambient, use wire with a minimum temperature rating of 75°C
8. The device can also be installed in Class I, Div. 2 Groups A B C D; Class II Div. 2, Groups E F & G (F & G only for FMRC); Class III Hazardous Locations and does not require connection to a protective barrier when installed per the CEC (for CSA) or the NEC (for FMRC) and when connected to a power source not exceeding 30 *Vxx*. WARNING – Explosion Hazard – Do Not Disconnect Equipment Unless Power Has Been Switched Off Or The Area Is Known To Be Non-Hazardous.

NOTE:

10. For CSA Certification CSA Certified Barriers with linear output characteristics MUST BE USED. Refer to table for proper barrier selection

BARRIER OUTPUT Isc	TYPICAL LINEAR BARRIER OUTPUTS		
	Voc	Ca	La minimum
80mA	30V	0.12uF	4.0mH
100mA	28V	0.13uF	3.0mA
120mA	26V	0.17uF	2.3mA
140mA	24V	0.21uF	1.7mA

Non-Linear Barriers must not be used;
Their Voc & La values are typically much less than values given in the above table

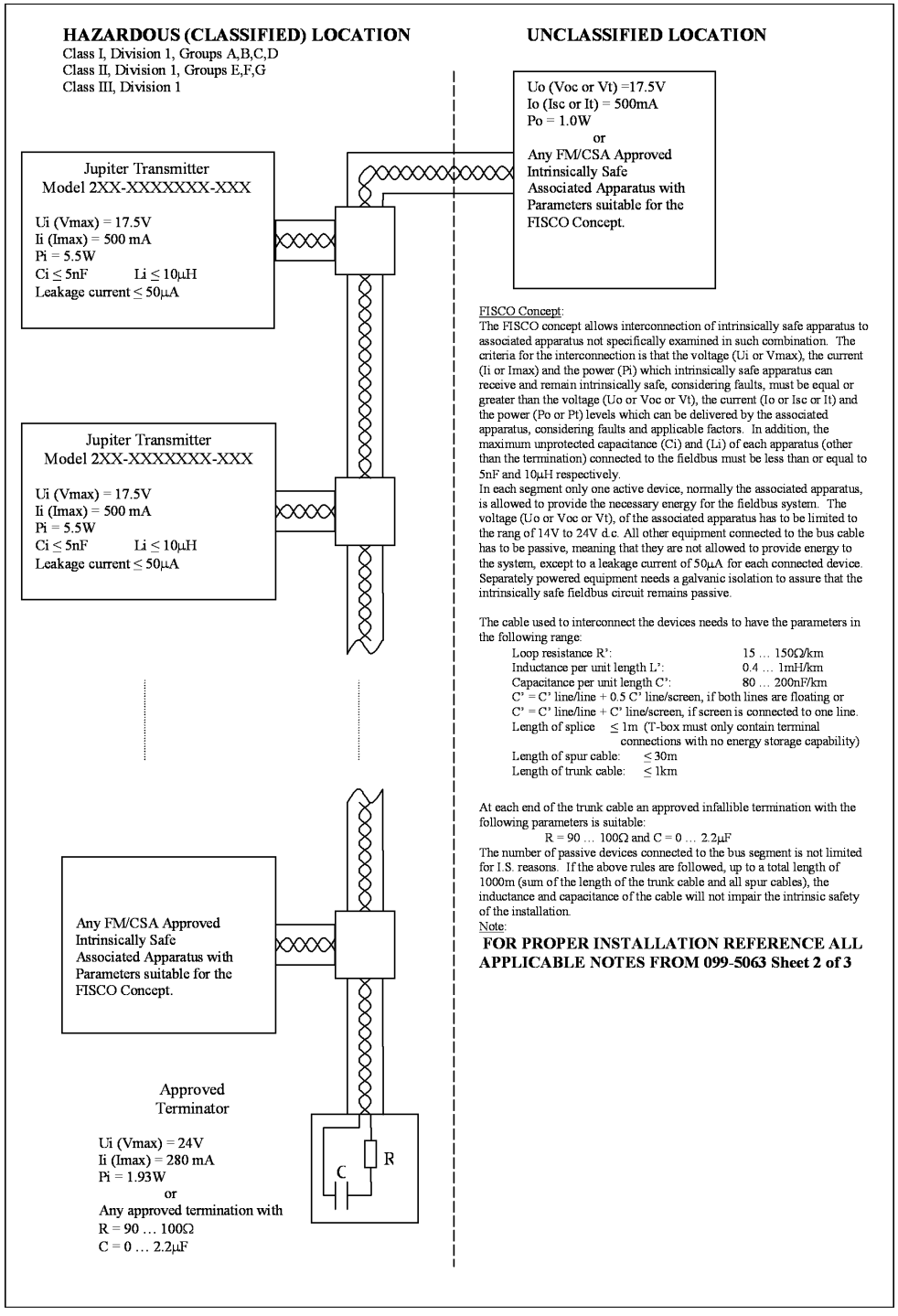
Magnetrol®

5300 BELMONT ROAD, DOWNER'S GROVE
ILLINOIS 60515, AREA CODE 630/969-4000

099-5063-F SHEET 2 OF 3

Drawing Last Modified: Monday, August 14, 2006 11:15:26 AM

2.4.1 Agency Drawing



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2.4.2 Agency Specifications – Explosion Proof Installation

Factory Sealed:

This product has been approved by Factory Mutual Research (FM) and Canadian Standards Association (CSA) as a Factory Sealed device.

NOTE: Factory Sealed: No Explosion Proof conduit fitting (EY seal) is required within 18" of the transmitter. However, an Explosion Proof conduit fitting (EY seal) is required between the hazardous and safe areas.

Caution: Grounding (+) will cause faulty operation, but will not cause permanent damage.

Caution: Do not rotate the Jupiter electronics enclosure or any threaded fittings. Rotating the electronics enclosure **will void warranty** and could cause damage to sensor cables.

2.4.3 Agency specifications ATEX Intrinsically safe

Entity parameters 4–20 mA:
Ui 28.4 Ii = 94 mA Pi = 0.67@ Ci = 2.2 nF Li = 3µH

Entity parameters Fieldbus Fisco:
Ui = 17.5V Ii=380mA Pi = 5.32W Ci = 0.705 nF Li = 3µH

2.5 Maintenance

2.5.1 Keep Control Clean

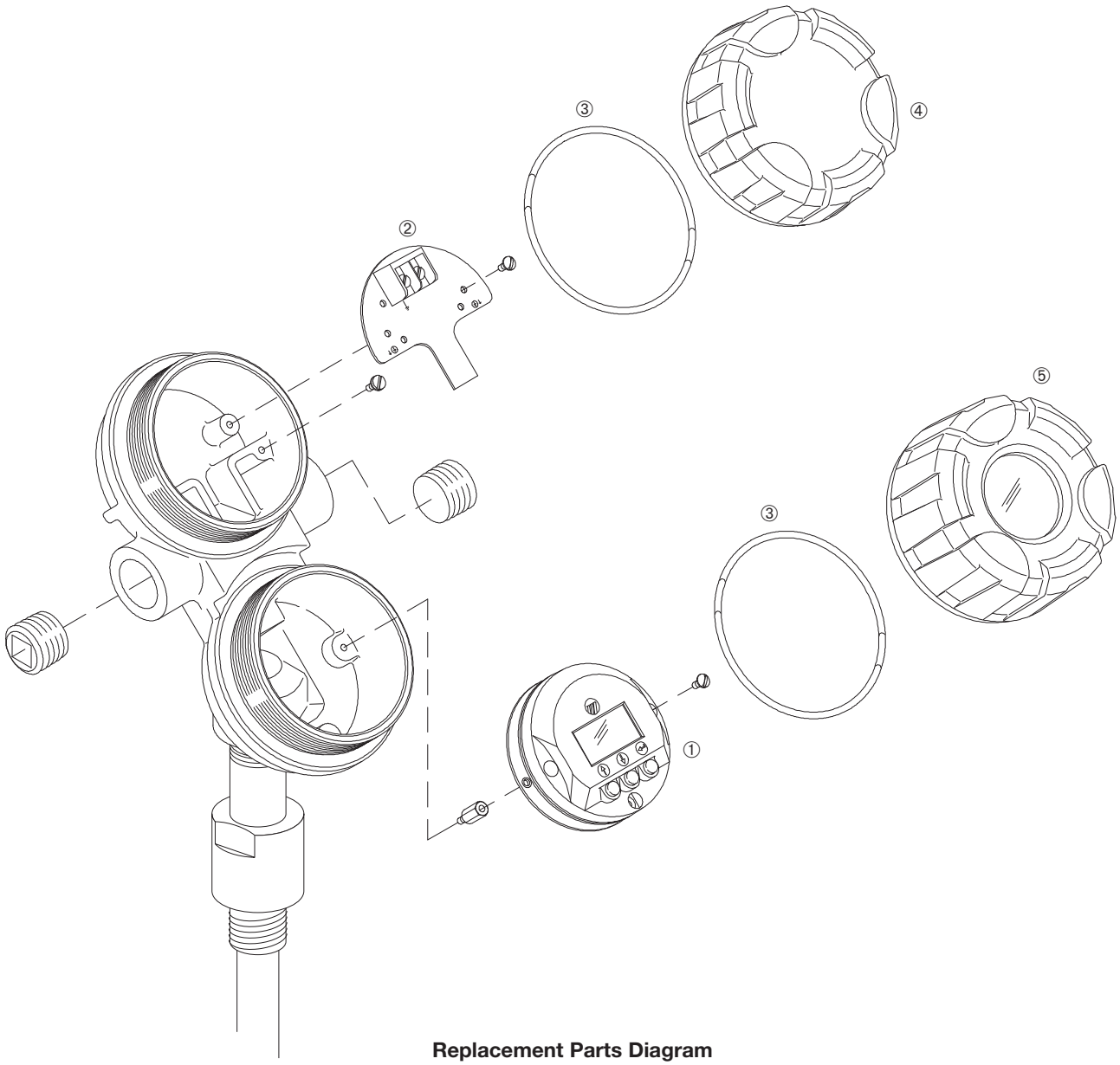
Periodic inspections are a necessary means to keep your level control in good working order. This control is a safety device to protect the valuable equipment it serves.

If the process liquid is clean (no solids or deposits), the MLI should require minimum maintenance. If the process liquid is dirty (solids and deposits), it is recommended the external cage be isolated from the process and flushed periodically. For complete cleaning, drain the unit, remove the bottom flange and float, inspect cage and float for build-up and clean if required.

2.6 Replacement Parts

2.6.1 Parts Identification

Item	Description	Part Number
①	Electronic module	
	Display and HART	031-2839-001
	Display & FOUNDATION fieldbus™	031-2840-001
②	Terminal board	
	HART	030-9151-001
	FOUNDATION fieldbus™	030-9151-004
③	O-ring (Viton®)	012-2201-237
④	Aluminum housing cover without glass	004-9193-002
⑤	Aluminum housing cover with glass	036-4410-003



Replacement Parts Diagram

2.7 Specifications

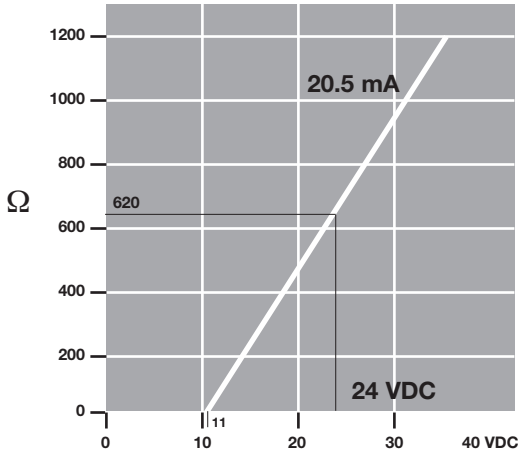
2.7.1 Performance

Accuracy		±0.015"
Repeatability		±0.005% of full span or 0.005" (0.127 mm) (whichever is greater)
Linearity		0.020% of full span or 0.031" (0.794 mm) (whichever is greater)
Maximum level rate of change		6 inches per second (models with HART)
Response time		0.1 second
Warm-up		<5 second
Upper dead zone		None
Lower dead zone		<2" (5 cm), SIL 2: <5" (13 cm)
Ambient temperature range	Transmitter:	-40° to +175° F (-40° to +80° C)
	LCD:	-10° to +160° F (-20° to +70° C)
Process temperature	External Mount:	-40° to +248° F (-40° to +120° C)
		-320° to +850° F (-195° to +455° C) (with factory insulated MLI)
	Direct Insertion:	-40° to +200° F (-40° to +95° C)
		-40° to +500° F (-40° to +260° C) (high temperature probe)
Humidity		0 to 99% non-condensing
Electromagnetic compliance		EN 61326
Environmental protection compliance		EN 60654-1
Drop protection compliance		EN 50178
Surge Protection Compliance		EN 61326 (1000 V)
Maximum Pressure (Direct Insertion)		1700 psig @ +100° F (117 bar @ +38° C) (limited to the pressure rating of the selected flange or float)

2.7.2 Functional

Measured variables		Continuous liquid level
Input power (at terminals)		12-28 VDC
Signal output ①		4–20 mA
		4–20 mA with HART 5.0
		NAMUR NE 43 compliant with 3.8 to 21.5 mA useable range
Loop resistance		620 maximum ohms @ 24 VDC—refer to chart below
Power consumption		0.7 watt, refer to chart below
Damping		0 to 25 seconds
Error signal		3.6 or 22 mA, field selectable
User interface		3-button keypad, HART communicator, AMS software, PACT*ware*™
		or FOUNDATION Fieldbus
Display		2-line × 8-character LCD in inches or cm, mA, and % of level
Resolution	Analog:	0.01 mA
	Digital:	0.01 units
Span		6 to 400 inches (999 cm)
SIL 2		Safe Failure Fraction (SFF) 90.7% (consult factory for SIL safety manual)

① See Bulletin 46-649 for FOUNDATION Fieldbus output

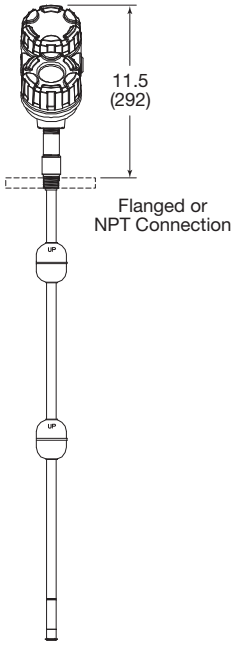


Power Consumption

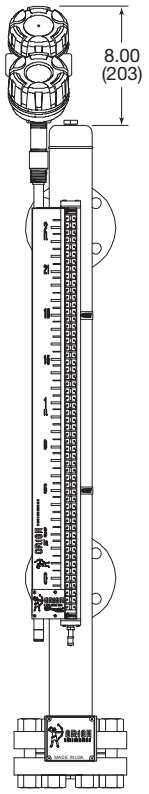
2.7.3 Physical

Enclosure type	Dual compartment
Enclosure material	Sand cast aluminum grade 356 HT or 316 stainless steel
Enclosure finish	Baked on polymer powder coat
Enclosure rating	NEMA 4X7/9, IP 66
Sensor material	316 stainless steel
Sensor length	6 to 400 inches (15 to 999 centimeters)

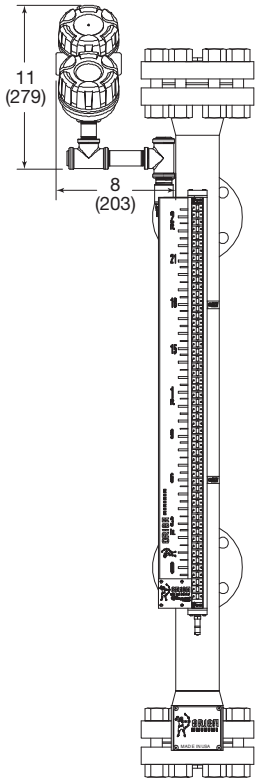
Inches (mm)



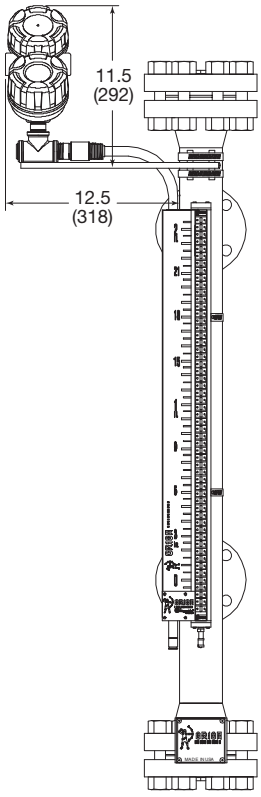
Direct Insertion



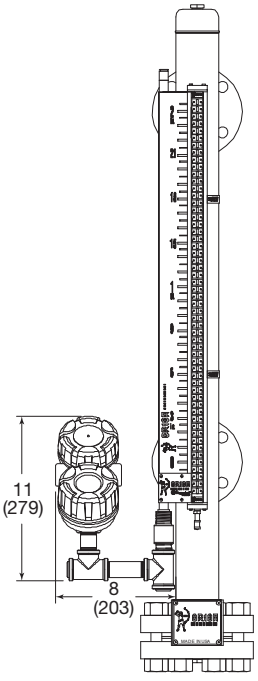
Top Mount



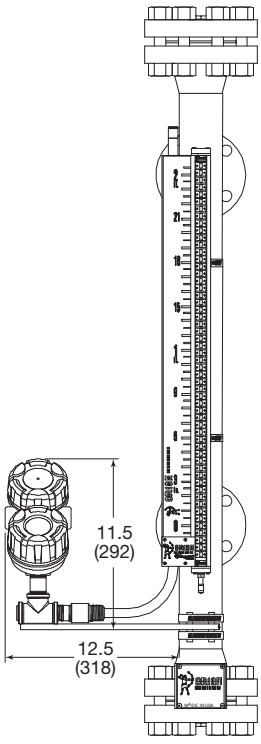
Top Mount Offset



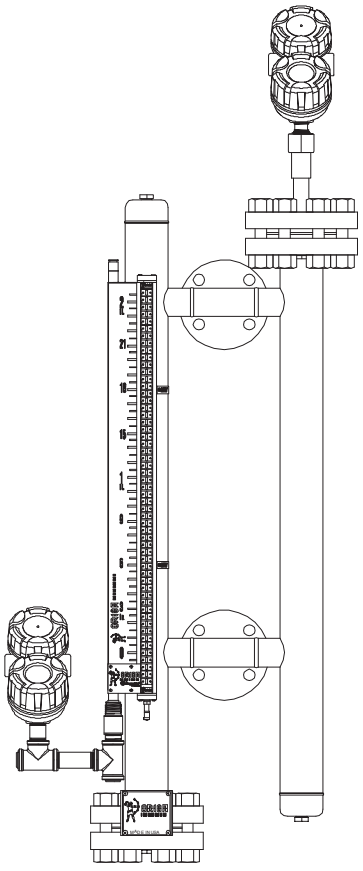
Top Mount Offset
High Temperature Bend



Bottom Mount Offset



Bottom Mount Offset
High Temperature Bend



Gemini – Bottom Mount Offset
and Secondary Transmitter

Glossary

Accuracy The maximum positive and negative % deviation from the actual value over the total span.

ANSI *American National Standards Institute.*

CSA *Canadian Standards Association* Canadian, third party agency that qualifies the safety of electrical equipment.

Damping The mathematical averaging of a meter and/or output signal to stabilize the effects of a noisy process due to surface turbulence.

Default Values The main position of the menu structure that displays the primary measurement values of LEVEL, % OUTPUT, and LOOP. The transmitter returns to this position after 5 minutes of inactivity.

DVM/DMM Digital Volt Meter/Digital Multimeter.

Electromagnetic Energy The radiation that travels through space as electric and magnetic fields varying with position and time. Examples in increasing frequency: radio waves, microwave, infrared light, visible light, ultraviolet light, x-rays, gamma waves, and cosmic waves.

EM *See Electromagnetic Energy.*

EMI *Electromagnetic Interference* Electrical noise caused by electromagnetic fields that may affect electrical circuits, particularly low-power electronic devices.

EN *European Normal* Committee guidelines in EC countries that take precedence over local, country guidelines.

Ergonomic A mechanism that considers human capability in its design or function.

Explosion-Proof Enclosure An enclosure designed to withstand an explosion of gas or vapor within it and prevent the explosion from spreading outside the enclosure.

Fault A defect or failure in a circuit. The current (mA) value unit defaults to 3.6, 22, or Hold when a diagnostic condition occurs.

Feedthrough A small, connecting cavity between the main housing compartments, carrying the cable that supplies the operating energy to the measurement circuitry and returns the output value proportional to level. This cavity is potted to maintain the environmental isolation between the two compartments.

FM *Factory Mutual* American, third party agency that qualifies the safety of electrical equipment.

FSK Frequency Shift Keying.

Ground An electrical connection to the Earth's potential that is used as a reference for the system and electrical safety.

Grounded A state where no electrical potential exists between the ground (green) connection on the transmitter and the Earth or system ground.

HART *Highway Addressable Remote Transducer.* Protocol that uses the Bell 202 frequency shift keying (FSK) method to superimpose low level frequencies (1200/2000 Hz) on top of the standard 4–20 mA loop to provide digital communication.

HART ID *See Poll Address.*

Hazardous Area An area where flammable gases or vapors are or may be present in the air in quantities sufficient to produce explosive or ignitable mixtures.

IEC *International Electrotechnical Commission* Organization that sets international standards for electrical devices.

Increased Safety Designs and procedures that minimize sparks, arcs, and excessive temperatures in hazardous areas. Defined by the IEC as Zone 1 environments (Ex e).

Interface: Electrical A boundary between two related, electronic circuits.

Interface: Process A boundary between two or more immiscible liquids.

Intrinsic Safety A design or installation approach that limits the amount of energy that enters a hazardous area to eliminate the potential of creating an ignition source.

Level The present reading of the height of material in a vessel.

Linearity The worst case error calculated as a deviation from a perfect straight line drawn between two calibration points.

Loop The present reading of the 4–20 mA current output.

Low Voltage Directive A European Community requirement for electrical safety and related issues of devices using 50-1000 VDC or 75-1500 VAC.

Magnetic Level Indicator a magnetically coupled, liquid level indicator which isolates the process in a sealed non-magnetic piping column. Contrasting colored flags provide indication of level.

Magnetostrictive Utilizing the Wiedemann effect to create a mechanical torsion or twist in a ferromagnetic wire which occurs as a result of the interaction between an electrical pulse on the wire and a magnetic field from the float.

Measured Value The typical level measurement values used to track the level of a process: Level, % Output, and Loop.

Media The liquid material being measured by the level transmitter.

Multidrop The ability to install, wire, or communicate with multiple devices over one cable. Each device is given a unique address and ID.

Nonhazardous Area An area where no volatile mixtures of vapors/gas and oxygen will be found at any time. *Also called General Purpose Area.*

Non-incendive Equipment and wiring which in its normal operating condition is incapable of igniting a specific hazardous atmosphere or hazardous dust layer.

Offset The distance from the bottom of the tank to the bottom of the probe.

Password A numerical value between 0 and 255 that protects stored configuration data from unauthorized manipulation.

Percent (%) Output The present reading as a fraction of the 16mA scale (4–20mA).

Poll Address A number between 1 and 15 which sets an address or location of a device in a multi-drop loop.

Probe A waveguide that propagates an electromagnetic pulse from the top of the tank into the process fluid.

Probe Length Exact measurement from the bottom of the process thread connection to the very bottom of the probe.

Range A value related to probe length (factory setting).

Repeatability The maximum error between two or more output readings of the same point.

RFI *Radio Frequency Interference* Electrical noise that can have an adverse affect on electrical circuits, particularly low-power devices.

Span The difference between the upper and lower limits of the range.

Specific Gravity (SG) The ratio of the density of a material to the density of water at the same conditions.

Tst Loop *Test Loop* Built-in system capability to test/calibrate a loop (or separate loop device) by driving the transmitter output to a particular value.

Trim 4/Trim 20 Built-in system capability to fine tune the 4 mA and 20 mA points so the transmitter output corresponds exactly to user's meter, DCS input, etc.

Two Wire An electrical instrument design that uses one set of wires to provide both the supply power and process measurement signal. The process measurement is achieved by varying the current of the loop. Also called *Loop Powered.*

Units The engineering units used to measure level in the system. The choices are in (inches) and cm (centimeters).

Jupiter Magnetostrictive Transmitter
Configuration Data Sheet

Copy blank page and store calibration data for future reference and troubleshooting.

Item	Value	Value	Value	TROUBLESHOOTING	
Vessel Name					
Vessel #					
Media & Dielectric					
Tag #					
Serial #					
Measurement Type				Correct Value	Incorrect Value
Units					
Probe Length					
4 mA Point					
20 mA Point					
Level Offset					
Damping					
Fault Choice					
HART Poll Address					
Trim 4 mA					
Trim 20 mA					
Loop Test					
Deadband					
Sensor Mount					
Trim Level					
Trim Interface					
Conversion Factor					
Scale Offset					
Float 1 Threshold					
Float 1 Polarity					
Float 2 Threshold					
Float 2 Polarity					
Sensitivity					
Drive Amplitude					
Minimum Separation					
# of Counts					
Software Version					
New Password					

Name **Date/Time**

Service Policy

Owners of Magnetrol/Orion Instruments controls may request the return of a or any part of an instrument for complete rebuilding or replacement. They will be rebuilt or replaced promptly. Instruments returned under our service policy must be returned by prepaid transportation. Magnetrol/Orion will repair or replace the control at no cost to the purchaser (or owner) other than transportation if:

1. Returned within the warranty period; and
2. The factory inspection finds the cause of the claim to be covered under the warranty.

If the trouble is the result of conditions beyond our control; or, is NOT covered by the warranty, there will be charges for labor and the parts required to rebuild or replace the equipment.

In some cases it may be expedient to ship replacement parts; or, in extreme cases a complete new instrument, to replace the original equipment before it is returned. If this is desired, notify the factory of both the model and serial numbers of the instrument to be replaced. In such cases, credit for the materials returned will be determined on the basis of the applicability of our warranty.

No claims for misapplication, labor, direct or consequential damage will be allowed.

Return Material Procedure

So that we may efficiently process any materials that are returned, it is essential that a "Return Material Authorization" (RMA) number be obtained from the factory, prior to the material's return. This is available through Magnetrol/Orion's local representative or by contacting the factory. Please supply the following information:

1. Company Name
2. Description of Material
3. Serial Number
4. Reason for Return
5. Application

Any unit that was used in a process must be properly cleaned in accordance with OSHA standards, before it is returned to the factory.

A Material Safety Data Sheet (MSDS) must accompany material that was used in any media.

All shipments returned to the factory must be by prepaid transportation.

All replacements will be shipped F.O.B. factory.

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